

ANEMONE TUBEROSA (RANUNCULACEAE) IN TEXAS

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ABSTRACT

Four species of *Anemone*, all with tuberous rootstocks, occur in Texas: *Anemone caroliniana* Walter; *A. berlandieri* Pritzl; *A. edwardsiana* Tharp; and *A. tuberosa* Rydberg. The recently described species *A. okennonii* Keener & Dutton is treated as within *A. tuberosa* where it is described anew as var. *texana* Enquist & Crozier, var. nov. A key and distribution maps are provided for the Texas taxa of *Anemone*.

KEY WORDS: Ranunculaceae, *Anemone*, Texas

INTRODUCTION

Anemone okennonii Keener & Dutton (1994) was recently described as a new species endemic to central Texas. Its authors noted (p. 192) it is "taxonomically closest to *A. edwardsiana*" but added the caveat that "whether these two species are closest phylogenetically remains in question." They observed that the geographic range of the new species overlaps with *A. berlandieri* Pritzl but appears to lie isolated between *A. edwardsiana* Tharp and *A. tuberosa* Rydberg. Based on our own field and herbarium experience, however, we believe that the relationship of *A. okennonii* lies with *A. tuberosa*. Earlier botanists, including Donovan Correll, Cyrus L. Lundell, Marshall Johnston, Billie Turner, and Barton Warnock, correctly identified material referable to *A. okennonii* as belonging to *A. tuberosa* (s.l.). In addition, we find several misidentified collections that were later correctly annotated as *A. tuberosa* by Marshall Johnston and Lloyd Shinnars. In this paper we have attempted to assess the status of *A. okennonii*, especially as regards its relationship to *A. tuberosa* and *A. edwardsiana*. This was accomplished by the examination of numerous populations in

the field as well as a review of herbarium material so as to determine the biological status of each.

MATERIALS AND METHODS

The authors examined fifteen populations of *Anemone tuberosa* in Crockett, Edwards, Kimble, Sutton, and Val Verde counties, from which more than 300 individuals from seven populations (see Table 1) were studied by Crozier for characters of the sepals and achenes. Including our own collections, we studied approximately 140 sheets of *A. tuberosa* from México, Arizona, New Mexico, and Texas.

DISCUSSION

Keener & Dutton (1994), relying upon Joseph & Heimberger (1966), assert that the range of *Anemone tuberosa* extends only into "extreme western Texas (El Paso Co.)". However, since the Joseph & Heimberger paper there has been a gradual published acknowledgment that *A. tuberosa* extends much farther east. Warnock (1970) identified *A. tuberosa* as present in Big Bend National Park in Brewster County, Texas. Correll & Johnston (1970) did not originally include *A. tuberosa* in the flora of Texas, but by 1976 Marshall Johnston had annotated numerous sheets in the University of Texas collection as *A. tuberosa* (Warnock T205; Warnock 442; Smith M338; Correll, Correll, & Benson 30844; Correll & Correll 30884; McVaugh 7729; Tharp 1800; Correll & Flyr 38359; Rose-Innes & Warnock 565; Warnock 5199; Turner & Warnock 273; Lundell & Lundell 10176; and Worthington 4229). Johnston (1988 & 1990), in reference to *A. tuberosa*, stated, "The occurrence of this species in Western Texas has been confirmed, including the occurrence in Big Bend National Park and other southern trans-Pecos areas east to the Pecos River." This located the species in Texas as far east as Pecos, Terrell, and Val Verde counties.

Dr. James Henrickson has placed a rough draft of the unpublished "Chihuahuan Desert Flora" in the University of Texas herbarium for corrections and annotations. In its present form, the draft gives the following range information for *A. tuberosa* . . . "Very local in trans-Pecos Texas. (El Paso, Culberson, Brewster, Pecos, Val Verde Cos.); rare in Coah. (Tule Canyon near the Rio Grande), mostly below 1000 meters; Baja C., Calif., Son., Ariz., N.M., Tex., Coah., N.L., early spring, Feb.-Mar."

Recent collections by the authors, in 1995, indicate that *Anemone tuberosa* Rydb. is not limited to trans-Pecos Texas (which is considered to be that part of Texas west of the Pecos River) but also occurs widely in the Edwards Plateau east of the Pecos River in Crockett, Val Verde, Sutton, Kimble, Edwards, and Uvalde counties (see Map 4).

In large part, Keener & Dutton differentiate *Anemone okennonii* by contrasting it with *A. edwardsiana*. We believe that such a comparison is irrelevant. Many

characters of *A. okennonii* that constitute "differences" when compared to *A. edwardsiana* become similarities when compared to *A. tuberosa* (see Keener & Dutton 1994, Table 1, p. 194-195). Of the "differences" that remain, most are the result of incomplete or inaccurate information regarding one or both of the subject species.

Keener & Dutton provided a chart (p. 201) summarizing eleven differences "between *A. okennonii* and other Texas species of *Anemone* with tuberous rootstocks. . . ." Four of the eleven contrasted characters, including leaf division, number of flowers per stem, time of flowering of central and lateral flowers, and sepal number were admitted to be like *A. tuberosa*. One other character, the linear divisions of the bracts, was said to be like *A. berlandieri*, but this would apply also to *A. edwardsiana* or the eastern elements of *A. tuberosa*. This leaves six characters that were said to be unlike those of the other Texas species of *Anemone*. Of these six, we find two, flower size and sepal shape, to be of little use due to the broadly overlapping ranges of these characters in the Texas species. Reddish-glandular leaf margins and tips are not distinctive, but are common to all the Texas species of *Anemone*, particularly in the colder months. Likewise, yellow anthers are common to all the Texas species. We believe that attempts to distinguish subtle shades of yellow are too subjective to be of any value. The two remaining characters, style color and leaf dissection, are also problematic. The lavender-tinted styles of *A. okennonii* were said to be distinctive, but elsewhere in their paper (p. 196) Keener & Dutton stated that the styles of *A. tuberosa* are lavender. Additionally, Keener & Dutton reported that the styles of *A. caroliniana* and *A. berlandieri* are greenish with lavender tips. We believe the last remaining "distinctive" character of *A. okennonii*, the "typically 3-ternate" character of its leaves, results from a misinterpretation of leaf morphology. Despite the assertion that the leaves of *A. okennonii* are "typically 3-ternate", we find no instance in which this is the case, that is, thrice-ternate leaves for this taxon are not only not typical, but are also apparently non-existent. The leaves of *A. tuberosa* in Texas are typically once to twice-ternate (see Figure 1), as are the leaves of *A. tuberosa* in New Mexico, Arizona, Utah, and California. We carefully searched our collections for any leaf that might be considered 3-ternate. The most extreme example of leaf dissection we could find was from a depauperate population infected with black rust found 1.35 miles south of the Llano River on highway 385 in Kimble County. This leaf is illustrated with a line drawing in Figure 1 - H. Close examination of the actual leaf reveals that the margins of the central subleaflet of the central leaflet are continuous, *i.e.*, there is no formation of the petiolules that would be necessary to describe this as a further ternate division. The leaf is smaller than normal, with a reduced surface area, and is probably more deeply incised than normal due to disease stress. None of the other populations we found, which were all healthy, displayed central subleaflets so deeply incised.

Alternatively, we note that the leaves of *Anemone tuberosa* often have lateral leaflets that are asymmetrically ternately divided (see Figure 1, A-G). The two leaves shown in the type drawing of *A. okennonii* (Keener & Dutton 1994, p. 199) apparently are drawn from a collection in which the positions of the central leaflet and a lateral leaflet are transposed, that is, the apparent central leaflets are actually lateral leaflets. This may have contributed to the confusion over the number of ternate divisions.

TABLE 1 — VARIATION OF SEPAL AND ACHENE CHARACTERS WITHIN AND BETWEEN POPULATIONS OF ANEMONE TUBEROSA VAR. TEXANA.

Population	sepal number	sepal length (mm)	sepal width (mm)	achene length (mm)	achene width (mm)	style length (mm)
Edwards Co. [Hwy. 377 NE of Carta Valley]						
				(N=31)		
average	-	-	-	2.7	2.4	1.0
std	-	-	-	0.3	0.3	0.1
range	-	-	-	2.0-3.1	2.0-3.0	0.7-1.2
Val Verde Co. [Hwy. 189 NE of Juno]						
				(N=35)		
average	8.0	14.4	4.3	2.9	2.8	1.0
std	0.5	2.2	0.9	0.2	0.5	0.1
range	7-9	10.0-19.5	3.0-6.0	2.5-3.1	2.0-3.2	1.0-1.1
Val Verde Co. [Hwy. 277 N of Del Rio]						
				(N=23)		
average	-	-	-	3.2	3.1	1.1
std	-	-	-	0.3	0.2	0.1
range	-	-	-	3.0-4.0	2.8-3.8	0.9-1.3
Crockett Co. [Hwy. 2083 28.7 miles N of Pandale]						
				(N=39)		
average	8.5	12.3	3.7	3.0	3.0	1.0
std	1.3	2.4	1.0	0.1	0.1	0.1
range	7-12	5.0-18.0	2.5-6.5	2.7-3.2	2.5-3.2	0.9-1.2
Crockett Co. [Hwy. 2083 18.2 miles N of Pandale]						
				(N=40)		
average	-	-	-	2.8	2.3	1.0
std	-	-	-	0.3	0.9	0.1
range	-	-	-	2.1-3.3	2.1-3.1	0.9-1.2
Kimble Co. [Hwy. 385 1.3 miles S of Llano R.]						
				(N=37)		
average	-	-	-	2.7	2.5	1.0
std	-	-	-	0.3	0.5	0.1
range	-	-	-	2.0-3.0	1.8-3.2	0.7-1.2
Kimble Co. [Hwy. 385 3.2 miles S of Llano R.]						
				(N=21)		
average	-	-	-	3.0	3.0	1.1
std	-	-	-	0.1	0.2	0.3
range	-	-	-	2.8-3.2	2.5-3.4	0.9-2.2

TABLE 2 — COMPARISON OF ANEMONE TUBEROSA AND ANEMONE EDWARDSIANA.

	<i>A. tuberosa</i> var. <i>tuberosa</i>	<i>A. tuberosa</i> var. <i>texana</i>	<i>A. edwardsiana</i>
TUBEROUS ROOTSTOCKS			
length	1.5-2 cm	1-3 cm	1-1.5(2) cm
width	1.0 cm	(0.7)1(1.2) cm	0.5-1(1.2) cm
BASAL LEAVES			
dissection	1-2 ternate	1-2 ternate	ternate
petiole length	4-10 cm	(3)4-12(16) cm	(3)4-12(20) cm
HEIGHT AT ANTHESIS			
	1-3 dm	1-3(4) dm	1-4(4.5) dm
PEDUNCLE			
pubescence below bracts	glabrous to glabrescent	glabrous to glabrescent	glabrous to glabrescent
number of flowers	1-3	1-3	1-3
time of flowering	central before lateral	central before lateral	central before lateral
BRACT			
shape	similar to basal leaves but shorter petiole & longer lobes and teeth	linear lobes	linear lobes
SEPALS			
number	6-13	6-12	7-13
color	white to pink	white to pink	white
shape	linear-oblong	linear-oblong or oblanceolate	linear-oblong or oblanceolate
length x width	20.0 x 3.0 mm	5.0-19.5 x 2.0-6.5 mm	5.0-22.0 x 1.5-6.2 mm
FRUITING HEAD			
shape	cylindrical to ellipsoidal	cylindrical to ellipsoidal	cylindrical to ellipsoidal
length	1.5-3.0 cm	1.5-3.5(4) cm	1-1.5 cm
width	1.0-1.5 cm	0.8-1.0(1.2) cm	0.4-0.9 cm
ACHENE			
pubescence	villous	villous	sparse with hairs on margin and base
width	2.1-4.0 mm	2.2-3.5 mm	2.2-3.0 mm
STYLE			
color	violet	violet	yellow-green to green
length	1.5 mm	0.8-1.6 mm	0.5-1.4 mm
HABITAT			
	high dry rocky slopes	rocky slopes and grassy flats	shaded canyons to open, rocky slopes

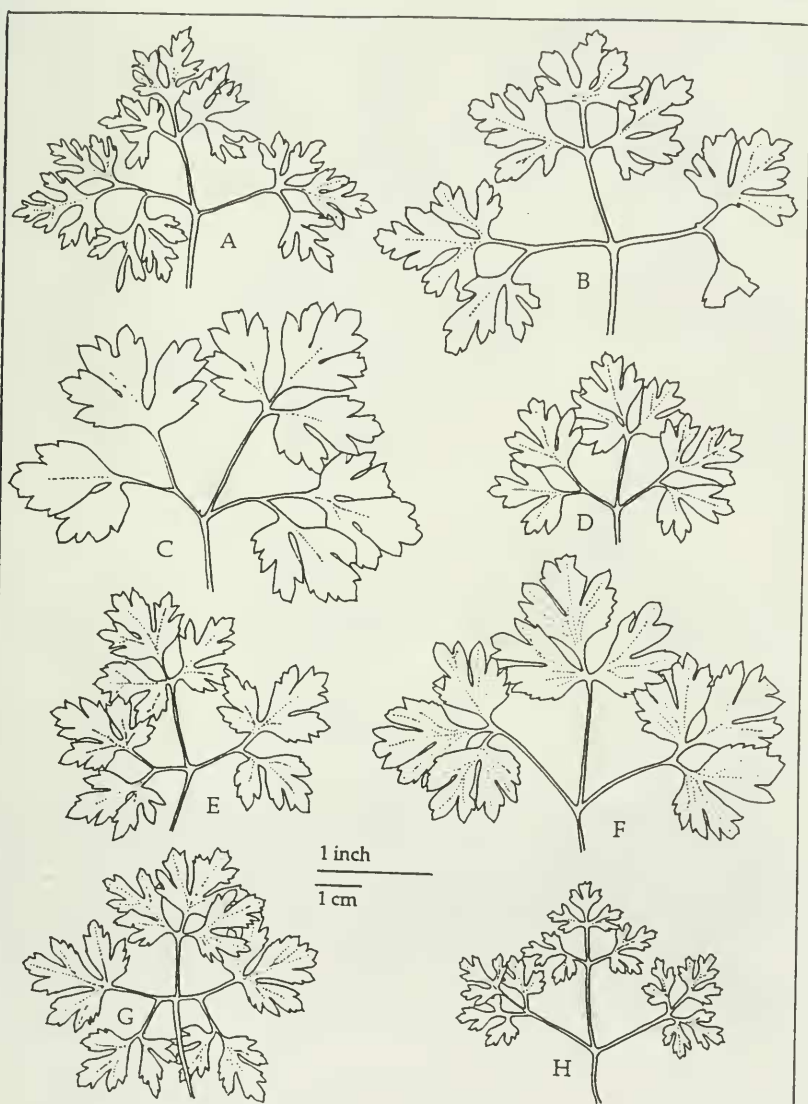


FIG. 1 — LEAF VARIATION IN ANEMONE TUBEROSA. A. New Mexico, Luna Co., Florida Mts, 7 Mar 1897, C.L. Herrick 309 (NMU) B. Texas, Brewster Co., Alpine, 20 Mar 1937, Barton Warnock T205 (TEX-LL) C. Texas, Crockett Co., Ft. Lancaster, 26 Feb 1995, M. Enquist 2710 (TEX-LL) D. Texas, Val Verde Co., Near int. of 277 & 377, 17 Apr 1995, M. Enquist, B. Crozier, & B.L. Turner (TEX-LL) E. Texas, Val Verde Co., 0.8 mi. S of Buckley Crossing on 189, 19 Mar 1995, M. Enquist & B. Crozier 2747 (TEX-LL) F. Texas, Kimble Co., S of Junction, 2 Apr 1995, M. Enquist 2780 (TEX-LL) G. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, 2 Apr 1995, M. Enquist 2776 (TEX-LL) H. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, heavily infected with Black Rust, 2 Apr 1995, M. Enquist 2776 (TEX-LL).

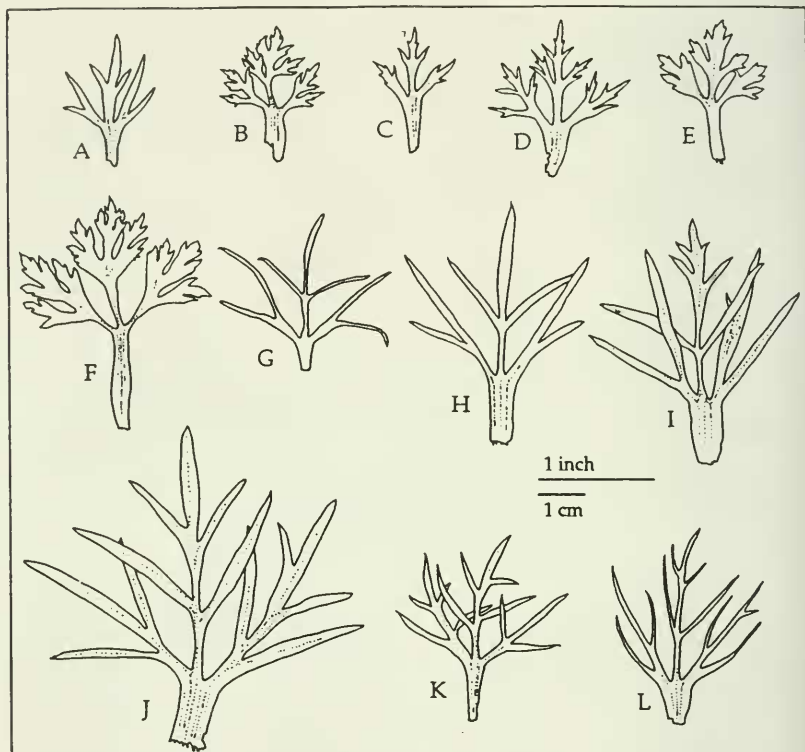
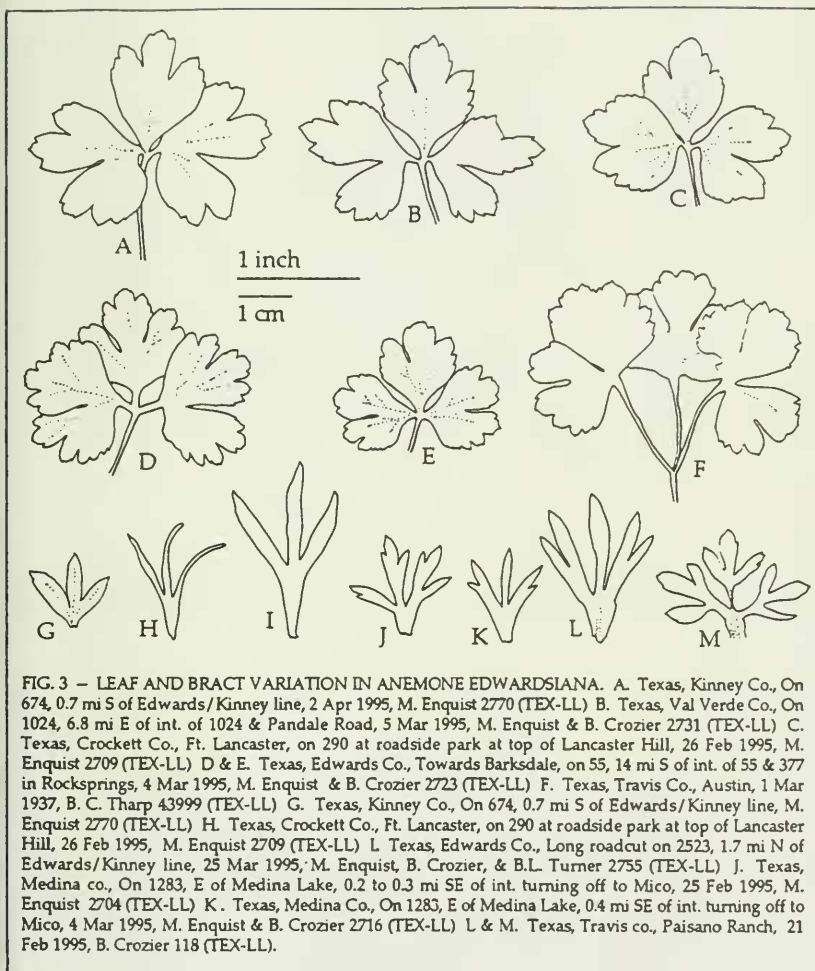
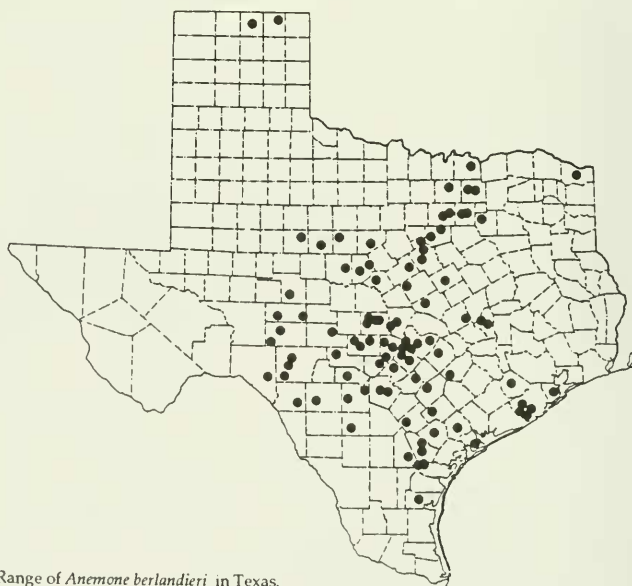


FIG. 2 — BRACT VARIATION IN ANEMONE TUBEROSA. A. Mexico, Nuevo Leon, Villaldama, 15 Mar 1983, Cowan & Nixon 3809 (TEX-LL) B. Arizona, Pinal Co., 1 Mar 1968, Keil, Pinkava, & Lahto 10790 (TEX-LL) C. Arizona, Pima Co., Ajo Mts., 4 Apr 1948, Fouts 368 (NMU) D. Arizona, Santa Cruz Co., 1 Mar 1986, Ferguson S.N. (TEX-LL) E. New Mexico, Dona Ana Co., Las Cruces, ridge N of Bishop's Cap, 16 Apr 1995, M. Enquist & B Crozier 2799 (TEX-LL) F. Texas, El Paso Co., Franklin Mts., 1 Apr 1979, Worthington 4229 (TEX-LL) G. Texas, Pecos Co., NE of Ft. Stockton, 15 Apr 1941, Lundell 10176 (TEX-LL) H. Texas, Crockett Co, 24 mi N of Pandale, 12 Mar 1995, M. Enquist & B. Crozier 2734 (TEX-LL) I & J. Texas, Val Verde Co., On 277, 1.1 mi S of int of 277 & 377, 17 Apr 1995, M. Enquist & B. Crozier 2802 (TEX-LL) K. Texas, Kimble Co., 3.2 mi. S of Llano River on 385, 17 Apr 1995, M. Enquist & B. Crozier 2804 (TEX-LL) L. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, 9 Apr 1995, Enquist 2790 (TEX-LL).





MAP 1 - Range of *Anemone caroliniana* in Texas.



MAP 2 - Range of *Anemone berlandieri* in Texas.



MAP 3 - Range of *Anemone edwardsiana* in Texas.



MAP 4 - Range of *Anemone tuberosa* in Texas. Solid dots = *A. tuberosa* var. *texana*. Open circles = *A. tuberosa* var. *tuberosa*.

We believe that once these putative "differences" are discounted, a comparison of leaf characters, achene size and pubescence, and style color indicates that the type of *Anemone okennonii* clearly fits within *A. tuberosa* (see Table 2).

The obvious differences between *Anemone tuberosa* and *A. edwardsiana* (compare Figure 1 & Figure 2 with Figure 3) may be easily contrasted in the field, where the two are often found in either closely adjacent or intermingled populations. We found the two species growing together in two populations in Val Verde County and two populations in Crockett County. Our collections indicate *A. edwardsiana* ranges from the eastern edge of the Edwards Plateau west to the valley of the Pecos River (see Map 3). We have seen one sheet that appears to be a mixed collection of *A. tuberosa* and *A. edwardsiana* from Brewster County. Although we consider it likely that *A. edwardsiana* is also continuously distributed from the Pecos River west to Brewster County, we were not able to confirm its range west of the Pecos because that area, roughly to Sierra Blanca, was suffering a severe four year drought at the time we made our collections.

Of the nine collections of *Anemone okennonii* cited in the protologue, we interpret seven of them, all made in the 1940's, as typical *A. tuberosa*. The remaining two collections were made by Mr. O'Kennon in 1992 and 1993. Since the type description and illustration of *A. okennonii* do not match the appearance of *A. tuberosa*, we tried to visit the O'Kennon collection sites to determine if these populations were somehow different. The type collection (as published) is said to be from Gillespie County, "high on a shallow roadcut in sandy loam, FM 783, 2 mi S of Doss, 22 Apr 1993". At the stated locality, a closely grazed hillside, we found an abundance of *A. berlandieri* but nothing resembling *A. okennonii* or *A. tuberosa*. The other collection (as published) is said to be from Kimble County, "Hwy 385, 2.5 mi S of Llano River, 9 Mar 1992". At this locality, a gently rolling plain in red sandy loam, we again found an abundance of *A. berlandieri*, but nothing resembling *A. okennonii* or *A. tuberosa*. Repeat visits and careful searches of these localities on an almost weekly basis from mid February through mid April yielded only *A. berlandieri*.

Examination of the holotype (BRIT) and the Kimble County collection (BRIT) offered little additional information about the exact locality of *Anemone okennonii*, but we did note that the type specimen we were shown was heavily infected with black rust. The label for the type locality reads. . . "Gillespie Co.: high on shallow roadcut in sandy loam, along FM 783 at Edwards Creek, 2 miles S of Doss, Robert J. O'Kennon 11390, 22 Apr 1993." We found such a roadcut 2.3 miles south of Doss at Edwards Creek but again found nothing resembling *A. tuberosa* or the plant described as *A. okennonii*.

The specimen label for the only other cited collection was similarly brief, reading: "Kimble Co., Hwy 385 2.5 miles So. Llano River. High on shallow roadcut in rocky limestone, Robert J. O'Kennon 8813, 9 March 1992." The label data is ambiguous. Although there is a South Llano River, Highway 385 does not cross it. The North and South forks of the Llano River unite in Junction, with the river then flowing northeast towards Highway 385. We conclude that the label intends to indicate a locality 2.5 miles south of the Llano River on Highway 385, as stated in Keener & Dutton (1994). As we have said, this location is a gently rolling plain of red sandy loam, with no roadcut in sight. Here, we did find *Ferocactus setispinus* Engelm., which was listed

as a plant associate of *Anemone okennonii*, but we found no evidence of the latter species. Searching for roadcuts in limestone, we found one at 1.35 miles south of the Llano River with a small population of *A. tuberosa*. About 80% of the plants in this population were heavily infected with black rust, as was the type specimen said to be from Gillespie County. We also found an uninfected population of *A. tuberosa* at another roadcut 3.2 miles south of the Llano River.

We find the label data for the O'Kennon localities, including the type locality, to be inaccurate, confused, and incorrect as to mileages. We also believe there is a strong possibility that the locality of the diseased Gillespie County type specimen is actually the same as that of the diseased population 1.35 miles south of the Llano River in Kimble County.

In this paper, we treat *Anemone okennonii* as a synonym of *A. tuberosa*, but because plants resembling *A. okennonii* cannot be found at the type locality as stated in the label by Mr. O'Kennon for this taxon, and because the infected plants of the type collection seem likely to have been collected in Kimble County rather than Gillespie County, the problematic and ambiguous typification of this taxon cannot serve to establish its identity.

Because we regard *Anemone okennonii* as within *A. tuberosa* but as a distinctive easternmost segment of it, we treat the former at varietal rank. Recognition that *A. tuberosa* extends from El Paso County to central Texas amounts to a 400 mile range extension eastward for the species. The plants of the new variety differ slightly from typical *A. tuberosa*, and we have modified the description of the species to reflect their inclusion.

ANEMONE TUBEROSA Rydberg, Bull. Torrey Bot. Club 29:151-152. 1902.

Anemone sphenophylla sensu Britton, Ann. New York Acad. Sci. 6:220. 1891.
(but see discussion)

Robust, apically villous herbs; stems simple below, usually branched above involucre, 1-4 dm tall at anthesis, from brownish, oblong-obovate tuberous rootstocks 1-3 cm long and 1 cm thick. Radical leaves several, 1-2 ternate; petioles 4-12 cm long. Leaflets 1-2 cm wide, subglabrous, variously parted or cleft, with cuneate obovate segments having acute tips, sessile to petiolulate. Involucral bracts 3, similar to radical leaves in dissection or dissimilar with elongate lobes, reduced, short-petiolate, thinly pilose, positioned above middle of scape at anthesis; secondary branches one or more, 2-bracteate. Flowers 1-several per scape; lateral flowering branches maturing later than central flower; scape villous above involucre, subglabrous below. Sepals 6-13, white to pink, linear-oblong, 5-19 mm long, 2.5-6.5 mm wide, pubescent on the outer side; anthers yellowish-brown, ca. 1 mm long. Fruiting heads cylindrical to ellipsoidal, 1.5-4.0 cm long and 1.0-1.5 cm broad; achenes flat, orbicular, 2-4 mm wide, densely villous; styles reddish-purple to lavender, + or - erect, filiform, 1/3 to 1/2 length of achenes; $2n = 16$ (Joseph & Heimberger 1966).

February to May. High dry rocky slopes and grassy flats, southeastern California, southern Nevada, and southwestern Utah, southeastward through Arizona and New

Mexico to central Texas; south into Baja California, Coahuila, and Nuevo León in México. [description adapted from Keener & Dutton 1994].

ANEMONE TUBEROSA Rydberg var. *TUBEROSA*

Specimens examined:

MEXICO. Baja California: On bare rocky E slope of Cerro Matomi, 4 May 1973, *R. Moran 20797* (TEX-LL).

U.S.A. Arizona: Gila Co., Beside Beeline hwy, 14 mi S of Payson, 2 Apr 1960, *N.H. Russell 11352* (BRIT). Maricopa Co., Desert slopes by Apache Trail, 2 mi W of Canyon Lake, 28 Feb 1960, *N.H. Russell 11123* (BRIT); E side of Canyon Lake, 28 Feb 1960, *N.H. Russell 11159* (BRIT); Lake Pleasant Regional Park, 6 Apr 1966, *Moore, Pinkava, & Keil 152* (TEX-LL). Pima Co., Ajo Mts., 4 Apr 1948, *Fouts 368* (NMC); Hills W of Tucson, 17 Feb 1935, *F. Shreve 13163* (BRIT); Rocky hillside near Colossal Cave, Rincon Mountains, 25 Mar 1946, *C. Van Cleve 5* (TEX-LL). Pinal Co., 1 mi N of Peppersauce Canyon, 1 Mar 1968, *Keil, Pinkava, & Lahto 10790* (TEX-LL). Santa Cruz Co., Summit of Fragueta Peak, Cobre Ridge, Coronado Natl Forest, 1 Mar 1986, *G.M. Ferguson s.n.* (TEX-LL). New Mexico: Dona Ana Co., Bishop's Cap, 23 Mar 1935, *Hershey s.n.* (NMC); Tortugas Mts., 14 Mar 1941, *No collector, s.n.* (NMC); West of Organ Mts, 21 Mar 1941, *No collector, s.n.* (NMC); Little Mt., mesa west of Organ Mts., 7 Mar 1900, *E.O. Wooton s.n.* (NMC); Ridge on N side of Bishop's Cap, SE of Las Cruces, 16 Apr 1995, *M. Enquist & B. Crozier 2799* (TEX-LL,TAES). Luna Co., Florida Mts., 7 Mar 1897, *C.L. Herrick 309* (NMC); Hermanas, 18 Mar 1940, *A.L. Hershey s.n.* (NMC). Sierra Co., 1 mi W of Hillsboro, 30 Apr 1904, *O.B. Meicalfe 1558* (NMC). Texas: El Paso Co., E lower slopes of Mt. Franklin, 19 Apr 1952, *Barton Warnock 10409* (SRSC); E slopes of Fusselman Canyon, Franklin Mts., 25 Apr 1973, *Barton Warnock 23688* (SRSC); Slopes below Cottonwood Spring above Tom Mays Memorial Park, W side of Franklin Mts., 6 Apr 1970, *D.S. Correll & D. Flyr 38359* (BRIT,TEX-LL); Franklin Mts. along Trans-Mountain Road near Fusselman Canyon flood control dam, 1 Apr 1979, *R.D. Worthington 4229* (TEX-LL). Winkler Co., 5 mi E of Kermit, 24 Apr 1975, *Barton Warnock 23875* (SRSC).

Since the 1930's, many collections of *Anemone tuberosa* have been made in the western half of Texas. Its variation has not gone unnoticed. As a result, identifications have largely been divided between *A. tuberosa* and *A. sphenophylla* Poepp. We believe taxonomists have divided their identifications between these two names due to the character of the involucre bracts in most of the Texas plants.

Rydberg (1902) described the leaves and involucre bracts of *Anemone tuberosa* as follows ". . . basal leaves with petioles about 5 cm. long, twice ternate; divisions rhombic-cuneate in outline, ternately cleft and toothed; teeth oblong-ovate: . . . involucre leaves similar to the basal ones, but short-petioled and with longer lobes and teeth . . .". He cited specimens from Arizona, New Mexico, Utah, and California which presumably fit his description of a "leafy-bracted" *Anemone*.

Although specimens with involucre bracts fitting the typical elements of *Anemone tuberosa* can be found in extreme West Texas (El Paso County), other plants from

there east to Edwards County have involucre bracts unlike the type description. These plants have bracts with elongate, linear lobes and segments, usually with entire margins but sometimes few-toothed (see Figure 2).

Faced with this variation from the typical elements, many taxonomists in Texas have relied on the interpretation of Britton (1891), who expanded the name *Anemone sphenophylla* to include this taxon of the southwestern U.S. Britton described the leaves and involucre bracts of *A. sphenophylla* as follows: "Radical leaves slender-petioled ternately divided, the divisions obovate, obtuse, cuneate at the base, variously lobed and cleft; leaves of the involucre short-petioled or sessile by a narrowed base, palmatifid into linear or oblong acute segments . . .". This description would seem to better describe the linear-lobed bracts common to *A. tuberosa* in Texas and is the probable reason for the numerous label and annotation identifications of this taxon as *A. sphenophylla*. (We have seen no specimens of *A. sphenophylla* from Chile and do not address the question of whether this name has priority over the name *A. tuberosa*. We note the disjunct occurrence of *A. multifida* Poir. in Chile [Lourteig 1951] and would not be surprised at the disjunct occurrence there of the taxon under discussion in this paper).

Rydberg's description of the bracts of *Anemone tuberosa* was brief and somewhat ambiguous, describing the involucre leaves as similar to the basal ones "but short-petioled and with longer lobes and teeth . . .". When Rydberg described the bracts as being similar to the radical leaves, he may have had in mind bracts such as those in Figure 2 B, E, & F, as well as those with "longer lobes and teeth" exemplified by Figure 2 C & D. We believe the bracts illustrated in Figure 2 C & D represent an intermediate morphology between the western and eastern elements of *A. tuberosa*. In a comparison of specific individual plants, the difference between Figure 2 D (Santa Cruz Co., Arizona) and Figure 2 K (Kimble Co., Texas) is one of degree only.

We feel it is useful to contrast the western and eastern populations of *Anemone tuberosa*; those in Arizona are predominantly "leafy bracted" while those in most of the Texas range have bracts that are not "leafy bracted" but instead are predominantly elongately lobed. We propose that the name *Anemone tuberosa* var. *texana* be applied to those plants with elongately lobed bracts that are dissimilar to the radical leaves.

ANEMONE TUBEROSA Rydberg var. **TEXANA** Enquist & Crozier, var. nov.

TYPE: U.S.A. Texas: Val Verde Co., On Highway 277 north of Del Rio, 1.1 miles south of intersection of 277 & 377, abundant in bar ditch on east side of road, 25 Mar 1995, M. Enquist, B. Crozier, & B.L. Turner 2757 (HOLOTYPE: TEX-LL; Isotypes: TAES, BRIT)

Anemone okennonii Keener & Dutton, Sida 16(1):191-202. 1994.

Anemone tuberosae Rydb. var. *tuberosae* similis sed segmentis ultimis bractorum involucrealium linearibus integribusque differt.

Slender perennial herb, 4-30 cm tall at anthesis, from oblong or clavate tuberous rootstocks; radical leaves petiolate, 1-2 ternate, acute-tipped, 2-4 cleft, cuneate at the base; peduncle typically branched above the involucre bracts, appressed pubescent above the bracts and glabrate below; involucre bracts sessile, palmatifid into linear or oblong acute segments; flowers (1) 2 (3) per peduncle, the first peduncle naked,

subsequent ones involuclate; sepals 6-12, oblong-oval obtuse, often with retuse tips; pink, white, or white with pink streaks on the outer side, 0.5-1.9 cm long, pubescent on the outer side; fruiting head ovoid to cylindrical, 1.5-3.5 cm long; achenes tomentose, styles violet-purple, filiform, about 1/3 the length of the achene.

February to April. Rocky slopes to grassy flats, predominantly over limestone. In Texas, from El Paso County east to Kimble County; also in northern México.

Specimens examined:

MEXICO. Coahuila: Rio Grande, Tule Canyon, on Coahuila side above Upper Madison Falls, 10 Apr 1973, *M.C. Johnston, T.L. Wendt, & F. Chiang C. 10614* (TEX-LL). Nuevo León: Monterrey, 9 Mar 1923, *B.C. Tharp 1800* (TEX-LL); On "M" ridge side above San Pedro, Monterrey, 5 Feb 1961, *R. F. Smith M338* (TEX-LL); Rocky hillside 3.7 mi W of Bustamante, 4 Feb 1983, *C. Cowan 3782* (TEX-LL); Villaldama, Mountains E of state highway 34, 1.4 km N of junction to Bustamante, 15 Mar 1983, *C. Cowan 3809* (TEX-LL)

U.S.A. New Mexico: Eddy Co., Carlsbad Caverns Natl. Park, 19 Apr 1977, *T.L. Burgess 4476* (TEX-LL). Texas: Brewster Co., E slope of Pulliam above Moss Well at Big Bend National Park, 21 Mar 1967, *Barton Warnock 21142* (SRSC); Glass Mts., hills in back of Jim Nichols ranch house, 9 Mar 1947, *Barton Warnock 47007* (SRSC); Alpine, 20 Mar 1937, *Barton Warnock T205* (SRSC, TEX-LL); Pine Mt., about 12 mi E of Alpine, 19 Mar 1938, *B. Peyton & Barton Warnock T439* (SRSC); Dog Canyon, Big Bend Natl Park, 8 Apr 1958, *Barton Warnock & M. Johnston 15986* (SRSC); Lowest foothill slopes, Glass Mts., 21 Mar 1941, *Reg. Rose-Innes & Barton Warnock 565* (BRIT, TEX-LL); Chisos Mts., 15 Mar 1941, *Barton Warnock 442* (TEX-LL). Crockett Co., 14.8 mi W of Ozona, 14 Mar 1949, *B.L. Turner & Barton Warnock 273* (SRSC, BRIT, TEX-LL); Hwy 290, 1 mi E of Pecos River bridge, 9 Apr 1964, *J. Read 572* (SRSC); On 290, at roadside park at top of Lancaster Hill, Ft. Lancaster, 26 Feb 1995, 50 to 500 yds S of park under top of west-facing rim, 26 Feb 1995, *M. Enquist 2710* (TEX-LL, BRIT, TAES); On 290, at roadside park at top of Lancaster Hill, Ft. Lancaster, 5 Mar 1995, *M. Enquist & B. Crozier 2733* (TEX-LL); W side of Pandale Road, 24.4 mi N of int. of 1024 & Pandale Road, 12 Mar 1995, *M. Enquist & B. Crozier 2734* (TEX-LL, BRIT, TAES, MO, SRSC). Culberson Co., Victorio Canyon, E margin of Sierra Diablo, 18 Apr 1973, *M.C. Johnston, T.L. Wendt, & F. Chiang 10686* (TEX-LL). Edwards Co., Rock knob 14.2 mi NE of int. of 277 & 377, 4 Mar 1995, *M. Enquist & B. Crozier 2724* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 2523, 1.7 mi N of Edwards/Kinney Co. line at long roadcut, 25 Mar 1995, *M. Enquist, B. Crozier, & B.L. Turner 2750* (TEX-LL, BRIT, TAES). Kimble Co., On 385, 1.35 mi S of Llano River, E side of road on low roadcut through nodular limestone, 2 Apr 1995, *M. Enquist 2776* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 385, E side of road on low roadcut through nodular limestone, plants heavily attacked by black rust, 9 Apr 1995, *M. Enquist 2790* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 385, low roadcut to drainage, 3.2 mi S of Llano River, 17 Apr 1995, *M. Enquist & B. Crozier 2804* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 377, S of Junction, 0.3 - 0.4 mi N of first crossing of the Llano River, W side of curve, 2 Apr 1995, *M. Enquist 2780* (TEX-LL, BRIT, TAES, MO, SRSC, NMC). Pecos Co., Along Sanderson hwy 10-18 mi out of Ft. Stockton, 5 Apr 1953, *J. Scuddy 133* (SRSC); Along hwy 20 mi NE of Ft. Stockton toward McCamey, 27 Apr 1947, *Barton Warnock 5199* (SRSC, BRIT,

TEX-LL); N side of Sierra Madera range, 24 mi S of Ft. Stockton, 12 Apr 1947, *Barton Warnock 5064* (SRSC); 13.5 mi E of Ft. Stockton along hwy 290, 17 Apr 1965, *D.S. Correll & H. B. Correll 30884* (TEX-LL); On mesa N of Tunis Spring, about 19 mi E of Ft. Stockton, 5 Apr 1965, *D.S. Correll, H. B. Correll, & L. Benson 30844* (TEX-LL); Off US 67, E of Ft. Stockton, 15 Apr 1941, *C.L. Lundell & A.A. Lundell 10176* (TEX-LL). Sutton Co., on 189, SW corner of county, 0.8 mi NE of int. of 189 & Co. Rd. 410, 12 Mar 1995, *M. Enquist & B. Crozier 2741* (TEX-LL, BRIT, TAES); On 277, 4.3 mi S of int. of 277 & Loop 476 in Sonora, 19 Mar 1995, *M. Enquist & B. Crozier 2746* (TEX-LL, BRIT, TAES). Terrell Co., 13 mi W of Sanderson, 28 Feb 1947, *Barton Warnock 47083* (SRSC); 4.2 mi W of Sanderson, 14 Mar 1949, *B.L. Turner & Barton Warnock 319* (SRSC, BRIT); 31 mi S of Sheffield, 14 Mar 1949, *B.L. Turner & Barton Warnock 307* (SRSC, BRIT); 5 mi E of Dryden on US 90, 30 Mar 1950, *H.L. Surrat 179* (SR); 8 mi E of Dryden, 28 Mar 1947, *Barton Warnock 47107* (SRSC). Uvalde Co., Uvalde, common on sandy hills and prairies, 28 Feb 1919, *H.C. Hanson s.n.* (TEX-LL). Val Verde Co., 20 mi N of Langtry, 30 Mar 1947, *Barton Warnock & G.W. Brown 47301* (SRSC); Hills above dam at foot of Devils Lake, about 20 mi NNW of Del Rio, 31 Mar 1947, *R. McVaugh 7729* (BRIT, TEX-LL); 1.1 mi S of int. of 277 & 377, 25 Mar 1995, *M. Enquist, B. Crozier, & B.L. Turner 2757* (TEX-LL, BRIT, TAES, MO); 1.1 mi S of int. of 277 & 377, 17 Apr 1995, *M. Enquist & B. Crozier 2802* (TEX-LL, BRIT, TAES); Low, curving roadcut on 1024, 6.8 mi E of int. of 1024 and Pandale Rd in Pandale, 5 Mar 1995, *M. Enquist & B. Crozier 2730* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); County road to Juno at its int. with 1024, 12 Mar 1995, *M. Enquist & B. Crozier 2738* (TEX-LL); Loma Alta, 0.2 - 0.3 mi N of Loma Alta on E side of 277, 4 Mar 1995, *M. Enquist & B. Crozier 2727* (TEX-LL, BRIT, TAES, SRSC, NMC); E side of Pandale Road, 4.8 mi S of Pecos River crossing in narrow strip of grass along road, 12 Mar 1995, *M. Enquist & B. Crozier 2737* (TEX-LL); On 189, 0.8 mi S of Buckley's Crossing, 19 Mar 1995, *M. Enquist & B. Crozier 2747* (TEX-LL, BRIT, TAES, MO, SRSC, NMC); On 1024 to Pandale ca. 3 mi N of Junction with US 90 in Comstock, 14 Mar 1985, *B. Ertter & K.A. Bear 5601* (TEX-LL).

KEY TO TEXAS SPECIES OF *ANEMONE*

(adapted from Keener & Dutton 1994)

1. Plant spreading by rhizomes or stolons, involucre below middle of scape at anthesis; scape nearly glabrous below involucre; involucre bracts similar to at least some of the radical leaves; styles as long or longer than the ovoid achenes.1. *A. caroliniana*
1. Plant without rhizomes or stolons, involucre above middle of scape at anthesis; scape glabrous to pubescent below involucre, involucre bracts dissimilar or similar to radical leaves; styles less than half as long as the orbicular, flat achenes.(2)
 2. Scape simple, bearing one flower; involucre bracts distinctly dissimilar to radical leaves; scape densely pubescent below involucre.2. *A. bertlandieri*
 2. Scape usually branched, bearing two or more flowers per stem; involucre bracts similar or dissimilar to radical leaves; scape nearly glabrous to glabrous below involucre.(3)

3. Leaves 1 (-2) ternate; flowers white; translucent styles colorless to yellow-green.3. *A. edwardsiana*
 3. Leaves (1-) 2 ternate; flowers white to pink; translucent styles pale lavender to purplish-red.4. *A. tuberosa*

CONCLUSION

We conclude that the label data on type material of the O'Kennon collections are inaccurate and probably reflect confusion as to where the type specimens of *Anemone okennonii* were actually collected. Because of this, and because we recognize the taxon at a lower rank, we here redescribe it with a different name and better typification. Although we are aware that the *International Code of Botanical Nomenclature* recommends the retention of any name which might be replaced in a change of rank, we believe the broader systematic community is better served by the nomenclature provided here as to the geography to which it is largely confined, its inextricable relationship with *A. tuberosa*, and by the precise typification.

ACKNOWLEDGMENTS

We would like to thank Mike Powell and Sharon Yarborough of SRSC, Barney Lipscomb and Fiona Norris of BRIT, and Richard Spellenberg of NMC.

We thank Sara Hoot, to whom we have forwarded material for DNA work, for her comments.

We also thank Guy Nesom for the Latin diagnosis.

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